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Editorial overview: Innovations in food science: From bioactive to whole foods

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Michael A Rogers received his PhD with Alejandro Marangoni and Amanda Wright from the University of Guelph. He was an Assistant Professor at the University of Saskatchewan and Rutgers University before joining the Department of Food Science at the University of Guelph. While at Rutgers University he also was the Director for the Center of Gastrointestinal Physiology where he was awarded the inaugural Directors' award for Scientific excellence. His research interests are on self-assembly of fibrillar aggregates in molecular gels, biomaterials and bio-mimics, and the biophysics of digestion. He won the 2015 Young Research Scientist Award from the American Oil Chemists Society, where he is an active member currently serving as the Vice-Chair of the edible application (EAT) division.

Innovations in food science are occurring at such a rapid pace that they have and continue to transform our food supply. However, with these technological advances we must approach with extreme caution to ensure that the science keeps breadth with the technology. Food scientists and their industries have had negative impacts on their consumers with such advents of *trans* fats and carcinogenic by-products of Maillard reaction and as such there is often distrust by consumers and media that impede new technologies, with potentially extremely beneficial health consequence, from reaching the market place. It is imperative to note that along with our blunders, food scientists are responsible for our affordable, diverse and safe food supply, which is often taken for granted.

In this inaugural issue of 'Innovations in Food Science' we have the foremost experts from across the globe providing unique perspective to some of the most widely studied areas of food science and their consequences on human health. Before we conceptualized the importance of food bioactives, Hippocrates prophetically stated, 'let food be thy medicine' and over two thousand years later, we are only on the cusp of this emerging field. Dr. Paul Spagnuolo outlines the importance of bioactive in the treatment of blood cancers. Not only are potential benefits outlined but also the harms and which bioactives that should be avoided during chemotherapy. His work eloquently outlines how researchers must not operate in isolation and a healthy bioactive can become dangerous under specific conditions. He uses folic acid as an example that accelerates death when Methotrexate is used to treat acute lymphoblastic leukemia and reminds us that early chemotherapeutics were anti-foliate compounds. Dr. Julian McClements integrates the importance of the chemistry of delivery to avoid bioactive degradation in the complex alimentary tract. In accessing the efficiency and practically of the delivery vesicle several central features must be considered:

- Commercial feasibility where the encapsulating materials are food grade;
- Food matrix compatibility so that the delivery vehicle does not adversely effect the sensory attributes of the food material;
- Robustness to facilitate the survival of the delivery system during processing; and,
- Functional performance, which varies from application to application however, in general it must increase bioavailability, or control release.

In designing new and exciting delivery systems from polysaccharides, Dr. Vassilis Kontogiorgos and the team from the University of Huddersfield not only discuss bioactive delivery but also other novel applications such as masking flavors, modifying viscosity and their importance in gel chemistry.

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They also incorporate aspects of polysaccharide interactions with other food macromolecules such as proteins and cover their complexes. Dr. John Coupland communicates the significance of not over simplifying the nature of foods and they must be treated as multi-phasic complex systems with regards to chemical reactions that occur. The distribution of small molecules is of central importance in their chemical reactivity and this is affected by their rates of diffusion across interfaces and partitioning into different polarity phases. In studying the chemistry and release profiles of new physical systems, Dr. Maria Corradini and Dr. Richard Ludescher, review an underutilized technique where GRAS optical probes and their luminescent properties are used as a non-destructive method to assess numerous quality markers in prepared foods. They utilize compounds that are naturally present in foods or may be added to processed foods to assess quality, stability, bioavailability and safety of the food supply.

World authority, Dr. Jochen Weiss, eloquently reviews the antimicrobial paradox. Outlining, why they loose their activity in foods. Herein, he covers the major antimicrobials permitted into foods including lactates, acetates, parabens, phenolic acids and fatty acids esterified to phenols. Dr. Coupland's opinion in chemical reactivity seems to be closely mirrored by antimicrobial structure sensitivity in complex foods. As such, he cautions the use of simplified model systems as a marker for the true effects of anti-microbials' in foods.

In Western society, hypertension has reached pandemic. Dr. Rotimi Aluko provides a unique perspective of plant-protein derived antihypertensive peptides, which target renin and angiotensin converting enzyme. These peptides can modulate physiological conditions and improve chronic metabolic disorders and diseases. Along with hypertension, Westerners also face numerous chronic diseases that arise from the elevation consumption of heart-unhealthy fats. These unhealthy fats are often consumed in high concentrations due to the positive physical characteristics they impart to the food.

Dr. Farnaz Maleky reviews how to increase the control over these systems by use of external forces in different thermo-mechanical regimes. She provides a unique bottom up approach to understanding the effects of shear on the nano-structures, micro-structures and macro-structures in fats. Shear shows promise in the production of desirable structural behavior with acceptable physiochemical functionality. This topic is further elaborated on where the roles of external factors influencing lipid functionality is reviewed by a team of the top lipid chemists, Drs. Bayés-García, Patel, Dewettinck, Rousseau, Sato and Ueno. Here they review multiple aspects of lipid crystallization ranging from the effect of additives, temperature, shear, and interfaces. By garnering an intimate understanding between the crystallization of fats and oils, we may be able to engineer foods with less heart unhealthy fats while maintaining their desirable sensory properties.

In fully comprehending the impact of food formulation and bioactive release in the gastrointestinal tract, it is of central importance to have realistic models to study food form. Drs. Ferrua and Singh are leading the field in understanding the role of gastric digestion on food materials. Here they outline the potential applications of computation modeling tools to aid in the understanding of the physicochemical conditions that foods are exposed during digestion in the stomach. This is important to help facilitate the design of novel foods with enhanced functionalities.

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